APx585/586

multichannel audio analyzers

Specifications

Audio precision®

APx585 and 586
multichannel audio analyzers

Specifications

for APx500 version 2.3
December 2008

model APx585 with HDMI option

Audio precision

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Specifications

APx585 and 586 multichannel audio analyzers

with APx500 v2.2 or later measurement software
NP0020.00008 rev 4

Characteristic	Specifications	Supplemental Information
ANALOG GENERATOR		
Number of Channels	8, independent amplitude control	*DAC sample rate = 192 ks/s.*
Waveforms	Sine, continuously swept-sine, IMD test signals (SMPTE, MOD, DFD)	
Sine Characteristics		
Frequency Range	5 Hz to 80.1 kHz	*Frequency setting resolution is typically 192 kHz / (2^{32}) = 45 µHz*
Flatness (1 kHz ref)		
10 Hz to 20 kHz	±0.008 dB	*Typically <0.003 dB.*
20 kHz to 50 kHz	±0.030 dB	
50 kHz to 80 kHz	±0.10 dB	
Residual THD+N[1,2]		
20 Hz–20 kHz fundamentals	≤ (–103 dB + 1.4 µV)	
IMD Test Signals		
SMPTE & MOD		
LF Tone Range	40 Hz to 1 kHz	
HF Tone Range	2 kHz to 20 kHz	*HF tone must be ≥ 6 • LF tone.*
Mix Ratio	10:1, 4:1 or 1:1 (LF:HF)	*4:1 maximum with SMPTE signal.*
Residual IMD[1,2,3]	≤ 0.0025% [–92 dB]	

Characteristic	Specifications	Supplemental Information
DFD		
Tone Pair Mean Range	2.5 kHz to 20 kHz	*F_{mean} = (F1 + F2)/2.*
Tone Pair Difference Range	80 Hz to 2.0 kHz	*F_{diff} = |F2-F1|;* *F_{mean} must be ≥ 6 • F_{diff} .*
Residual IMD[1,2,3]	≤ 0.0010% [–100 dB]	
Frequency Accuracy	±0.0003% [3 PPM]	
Amplitude Range (all Waveforms)		
Balanced	< 1 µVrms to 14.40 Vrms [40.72 Vpp]	*Will drive 600 Ω load to +24.0 dBm.*
Unbalanced	< 1 µVrms to 7.20 Vrms [20.36 Vpp]	
Amplitude Accuracy (1 kHz)		
	±0.03 dB [±0.35%], +15° C to +30° C ±0.05 dB [±0.58%], 0° C to +45° C	
Source Resistance (Rs)		
Balanced	100 Ω, ±1 Ω	*Grounded, symmetrical*
Unbalanced	50 Ω, ±1 Ω	*Semi-floating (Z_f ≈50 Ω || 22 nF),* *±0.3 Vpk max BNC shield to ground.*
Max Peak Output Current		*Typically >30 mA; however, sum of all outputs must be ≤180 mA; reverse overload protected up to 1 A or 75 V.*
Crosstalk[1]		
Balanced	≤ (–100 dB + 1 µV) to 20 kHz	*With AP cable PN 4150.0001.*
Unbalanced	≤ (–115 dB + 1 µV) to 20 kHz	
Residual DC Offset	<0.25% of Vrms setting or 250 µV, whichever is greater.	

Characteristic	Specifications	Supplemental Information
ANALOG ANALYZER		
Number of Channels		
APx585	8, independently auto-ranging	*max ADC sample rate = 192 ks/s.*
APx586	16, independently auto-ranging	*max ADC sample rate = 96 ks/s when >8 channels are active; 192 ks/s if 8 or less are active.*
Input Ranges	320 mV to 100 V, 10 dB steps; ≈15% over-range in all ranges.	*Maximum rating, any input to ground, is ±160 Vpk, 115 Vrms, dc to 20 kHz.*
Input Impedance		
Balanced	100 kΩ || ≈230 pF, each side to gnd	
Unbalanced	100 kΩ || ≈230 pF, to BNC shield	*Semi-floating (Z_f ≈500 Ω || 22 nF), ±0.5 Vpk max BNC shield to ground.*
Input Coupling	DC	*Input bias current is typically <0.4 μA.*
Common Mode Rejection (Bal)		
320 mV, 1 V, 3.2 V ranges	≥ 70 dB, 5 Hz to 20 kHz	*±6 Vpk*
10 V range	≥ 50 dB, 5 Hz to 20 kHz	*±16 Vpk*
32 V range	≥ 50 dB, 5 Hz to 20 kHz	*±60 Vpk*
100 V range	≥ 45 dB, 5 Hz to 20 kHz	*±155 Vpk*
Input Related Crosstalk		
Balanced	≤ (–100 dB + 1 μV) to 20 kHz	*With AP cable PN 4150.0001.*
Unbalanced	≤ (–115 dB + 1 μV) to 20 kHz	
Level (Amplitude) Measurement		
Range	< 1 μVrms to 115 Vrms	
Accuracy (1 kHz)		
	±0.03 dB [±0.35%], +15° C to +30° C ±0.05 dB [±0.58%], 0° C to +45° C	
Flatness (1 kHz ref)		
10 Hz to 20 kHz	±0.008 dB	*Typically < 0.003 dB.*
20 kHz to 50 kHz	±0.030 dB	
50 kHz to 80 kHz	±0.10 dB	
Residual Noise (inputs shorted)	≤ 1.3 μVrms, 20 kHz BW	*Typically 8.1 nV/√Hz at 1 kHz.*

Characteristic	Specifications	Supplemental Information
THD+N Measurement		
Fundamental Range	5 Hz to 50 kHz	
Measurement Range	0 to 100%	
Accuracy	±0.5 dB	
Residual THD+N[1,2]		
20 Hz–20 kHz fundamentals	≤ (–103 dB + 1.4 µV, 20 kHz BW)	
Level & THD+N Response		
Weighting	High-pass (None, 5, 10, 15, 20, 22, 30, 50, 70, 100, 200, 300 or 400 Hz), A-wtd, CCIR-2k, CCITT or C-message	
Bandwidth (BW)	3 k, 5 k, 8 k, 15 k, 20 k, 22 k, 30 k, 40 k, 50 k, 80 kHz or None (typ >90 kHz).	*All selections except "None" exceed AES17 for roll-off characteristics.*
IMD Measurement		
Test Signal Compatibility		
SMPTE & MOD	Any combination of 40 Hz–1 kHz (LF) and 2 kHz–20 kHz (HF), mixed in any ratio from 1:1 to 10:1 (LF:HF)	*HF tone must be ≥ 6 • LF tone.*
DFD	Any two-tone combination with mean frequency of 2.5 kHz–50 kHz and a difference frequency of 80 Hz–2.0 kHz	F_{mean} *must be* ≥ 6 • F_{diff} .
IMD Measured		
SMPTE	Amplitude modulation of HF tone.	*Measurement BW is typ. 40–500 Hz.*
MOD & DFD	d2, d3, d2+d3, or d2+d3+d4+d5	*Use "d2+d3" for measurements per IEC60268.*
Measurement Range	0 to 20%	
Accuracy	±0.5 dB	
Residual IMD[1,2,3]		
SMPTE & MOD	≤ 0.0025% [–92 dB]	
DFD	≤ 0.0010% [–100 dB]	

Characteristic	Specifications	Supplemental Information
Frequency Measurement		
Range	< 5 Hz to 90 kHz	
Accuracy	±(0.0003% + 100 µHz)	*V_{in} must be ≥ 5 mV.*
Resolution	6 digits	
Phase Measurement		
Range	±180 deg	
Accuracy	±1 deg, 5 Hz to 5 kHz; ±2 deg, 5 kHz to 20 kHz; ±5 deg, 20 kHz to 50 kHz	*V_{in} must be ≥ 5 mV.*
Resolution	0.001 deg	
DC Voltage Measurement		
Ranges	320 mV to 100 V, 10 dB steps; ≈60% over-range in all ranges except max.	*Maximum rated input is ±115 V.*
Accuracy		
0.32 V range	±(0.8% reading + 600 µV)	
1 V–100 V ranges	±(0.8% reading + 0.1% range)	
Normal Mode Rejection		*Typically > 90 dB, 20 Hz to 20 kHz.*

Characteristic	Specifications	Supplemental Information
DIGITAL I/O		
DIGITAL OUTPUT RELATED:		
Formats		
Electrical, unbalanced	SPDIF-EIAJ per IEC60958, 0.5 Vpp or 1.00 Vpp (±10%) into 75 Ω	*Output R is nominally 75 Ω.*
Electrical, balanced	AES-EBU per AES3-1992, 5.00 Vpp (±10%) into 110 Ω	*Output R is nominally 110 Ω.*
Optical	Toslink®	
Sample Rate (SR) **Range**	22 kHz to 192 kHz	
Sample Rate (SR) **Accuracy**	±0.0003% [3 PPM]	
Channel Status Bits	Full implementation per IEC60958, automatically set, common to all channels	
User Bits & Validity Flag	Set to 0, all channels	
Residual Jitter[1,4]		
Electrical		*Typically <1.5 ns*
Optical		*Typically <2.5 ns*
EMBEDDED OUTPUT SIGNAL RELATED:		
Waveforms	Sine, continuously swept sine, IMD test signals (SMPTE, MOD, and DFD)	*8–24 bit word width, triangular PDF dither.*
Sine Characteristics		
Frequency Range	5 Hz to 0.499 • SR	
Flatness	Typically < 0.0005 dB	
Harmonics & Spurious Products	Typically < –160 dB	
IMD Test Signals		
SMPTE & MOD		
LF Tone Range	40 Hz to 1 kHz	
HF Tone Range	2 kHz to (0.499 • SR) or 20 kHz, whichever is lower	*HF tone must be ≥ 6 • LF tone.*
Mix Ratio	10:1, 4:1 or 1:1 (LF:HF)	*4:1 maximum with SMPTE signal*

Characteristic	Specifications	Supplemental Information
Residual IMD[1]	Typically < –136 dB, 4:1	
DFD		
Tone Pair Mean Range	2.5 kHz to (0.499 • SR – F_{mean} / 2) or 20 kHz, whichever is lower	*F_{mean} = (F1 + F2)/2.*
Tone Pair Difference Range	80 Hz to 2.0 kHz	*F_{diff} = |F2-F1|;* *F_{mean} must be ≥ 6 • Fdiff.*
Residual IMD[1]	Typically < –148 dB	

Characteristic	Specifications	Supplemental Information
DIGITAL INPUT RELATED:		
Formats		
Electrical	SPDIF-EIAJ per IEC60958 (unbal). Input R is selectable 75 Ω or ≈23 kΩ AES-EBU per AES3-1992. Input R is selectable 110 Ω or ≈2 kΩ.	
Optical	Toslink®	
Sample Rate Range	22 kHz to 192 kHz	
EMBEDDED INPUT SIGNAL RELATED:		
Level (Amplitude) Measurement		
Measurement Range	< –120 dBFS to +3 dBFS	
Accuracy (1 kHz)	Typically < 0.001 dB	
Flatness	Typically < 0.001 dB	
Residual Noise	Typically < –140 dBFS, 20 kHz BW	
THD+N Measurement		
Fundamental Range	5 Hz to 0.49 • SR or 50 kHz, whichever is lower	*Tuning can be set to track counter reading or generator setting.*
Measurement Range	0 to 100%	
Accuracy	±0.5 dB	*Exclude band from 0.70–1.40 F_0 .*
Residual THD+N[1]	Typically < –140 dBFS	
Notch Tuning Modes	Auto for meters, gen-track for graphs	
Level & THD+N Filters		
Weighting	High-pass (None, 5, 10, 15, 20, 22, 30, 50, 70, 100, 200, 300 or 400 Hz), A-wtd, CCIR-2k, CCITT or C-message	
Bandwidth (BW)	3 k, 5 k, 8 k, 15 k, 20 k, 22 k, 30 k, 40 k, 50 k, 80 kHz or None (typ >90 kHz).	*All selections except "None" exceed AES17 recommendations for roll-off and stop-band attenuation.*

Characteristic	Specifications	Supplemental Information
IMD Measurement		
Test Signal Compatibility		
SMPTE & MOD	Any combination of 40 Hz–1 kHz (LF) and 2 kHz–20 kHz (HF), mixed in any ratio from 1:1 to 10:1 (LF:HF)	*HF tone must be ≥ 6 • LF tone.*
DFD	Any two-tone combination with mean frequency of 2.5 kHz–50 kHz and a difference frequency of 80 Hz–2.0 kHz	*F_{mean} must be ≥ 6 • F_{diff} .*
IMD Measured		
SMPTE	Amplitude modulation of HF tone.	*Measurement BW is typ. 40–500 Hz.*
MOD & DFD	d2, d3, d2+d3, or d2+d3+d4+d5	*Use "d2+d3" for measurements per IEC-60268.*
Measurement Range	0 to 20%	
Accuracy	±0.5 dB	
Residual IMD[1]		
SMPTE & MOD	Typically < –136 dBFS, 4:1	
DFD	Typically < –148 dBFS	
Frequency Measurement		
Range	< 5 Hz to 0.499 • SR	
Accuracy	±(0.0003% + 100 µHz)	
Resolution	6 digits	
Phase Measurement		
Measurement Range	±180 deg, 5 Hz to 0.499 • SR	
Accuracy	Typically < 0.001 deg	
Resolution	0.001 deg	

Characteristic	Specifications	Supplemental Information
GENERAL/ENVIRONMENTAL		
Power Requirements	100–240 Vac ±10% (90–264 Vac), 50–60 Hz, with safety ground via approved power cord, 160 VA max.	*No range switching or fuse changes required.*
Temperature Range		
Operating	0° C to +45° C	
Storage	–40° C to +75° C	
Humidity	90% to +40° C (non-condensing)	
Max Operating Altitude	3000 m	
Stabilization Time	20 minutes	*Allow at least 60 minutes if unit is to be calibrated or adjusted, or if unit has been exposed to signficiantly different environmental conditions before being turned on.*
EMC	Complies with 89/336/EEC, IEC 61326-1: ELECTRICAL EQUIPMENT FOR MEASUREMENT, CONTROL AND LABORATORY USE -EMC REQUIREMENTS - PART 1: GENERAL REQUIREMENTS, CISPR 11/22 (class B), and FCC 15 sub J (class B).	*Emission and immunity levels are influenced by the shielding performance of interface and signal cables attached to the instrument. EMC compliance was demonstrated using Audio Precision cables.*

Characteristic	Specifications	Supplemental Information
Dimensions		
Width	432 mm (17.0 inches)	
Height	129 mm (5.08 inches)	
Depth	467 mm (18.4 inches)	
Weight	11.3 kg [24.8 lbs] for APx585 11.5 kg [25.3 lbs] for APx586	*HDMI option adds ≈0.2 kg [0.4 lbs].*
Safety	Complies with: 73/23/EEC, 93/68/EEC, and EN61010-1 2001, Equipment Class I, Installation Category II, Pollution Degree 2, Measurement Category I. CAN/CSA-C22.2 No 1010.1-04, Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use, Part 1: General Requirements (with Amendment 1). UL Std No 3111-1, Equipment for Measurement Use; Part I: General Requirements.	

Notes to Specifications

1. System specification including contributions from both generator and analyzer. Generator-only and analyzer-only contributions are typically less.
2. Generator load must be ≥ 600 Ω balanced or ≥ 300 Ω unbalanced for specified performance.
3. Analyzer input must be ≥ 200 mV for specified performance. Analyzer set to measure “d2+d3” IMD products for MOD and DFD modes.
4. Sample rate (SR) must be ≥ 27 kHz for specified performance. Jitter analyzer set for 700 Hz highpass response per AES3-1992.

Specifications

HDMI Option for the APx585 audio analyzer

with APx500 v2.2 or later measurement software
NP0020.00011 rev 0

Characteristic	Specifications	Supplemental Information
Revision	1.3	
Device Connections		
"Source"	Typically connects to the sink input of a Device-Under-Test.	*The video is an internally generated single color screen or the signal applied to the Auxiliary In connector. The audio is internally generated: see "Embedded Output Signal Related" under "DIGITAL I/O" for typical waveforms and parameters.*
"Sink"	Typically connects to the source output of a Device-Under-Test.	*The embedded and encoded audio signal components are recovered for analysis.*
"Auxiliary In"	Typically connects to an external source of video to be included in the Source output signal.	*Allows for the convenient insertion of video test signals generated by another instrument having HDMI source capability.*
"Auxiliary Out"	Typically connects to an independent monitoring device, contains the audio and video from Sink input.	
Hardware Interface	HDMI Type A	
EDID	256-byte EEPROM on both Sink and Auxiliary In	
CEC	CEC pass through from Auxiliary In to Source and from Sink to Auxiliary Out	

Characteristic	Specifications	Supplemental Information
Color Support	Deep Color, 36-bit	
Max Video Rate	1080p	

Specifications

DSIO Option for APx audio analyzers

with APx500 v2.3 measurement software
December 2008

Characteristic	Specifications	Supplemental Information
Functional characteristics		
Channels		
1 data line, TDM	2, 4 or 8	*Time division multiplexing (TDM).*
Multiple data lines	2, 4 or 8	*up to 4 data lines; 2 channels on each line by TDM.*
Data formats	Left justified, right justified, I2S, DSP	
Word width	8–32 bits	*cannot be less than bit depth.*
Bit depth (data length)	8–24 bits	
Sample rate (frame rate)	8 kHz–192 kHz	
Master Clock range	8 kHz–49.152 MHz	*dependent upon channel count, word width, sample rate and mulitplier settings.*
Logic voltage levels	1.8 V, 2.5 V, 3.3 V	
DC characteristics, no load		
1.8 volt setting		
High level input		
Minimum	0.8 V	
Low level input		
Maximum	1.0 V	
High level output		
Minimum	1.6 V	
Low level output		

Characteristic	Specifications	Supplemental Information
Maximum	0.1 V	
Absolute range		
Minimum	–0.5 V	
Maximum	5.5 V	
2.5 volt setting		
High level input		
Minimum	1.4 V	
Low level input		
Maximum	1.1 V	
High level output		
Minimum	2.2 V	
Low level output		
Maximum	0.1 V	
Absolute range		
Minimum	–0.5 V	
Maximum	5.5 V	
3.3 volt setting		
High level input		
Minimum	1.8 V	
Low level input		
Maximum	1.5 V	
High level output		
Minimum	3.0 V	
Low level output		
Maximum	0.1 V	
Absolute range		
Minimum	–0.5 V	
Maximum	5.5 V	
Input/Output impedance		
All Outputs	50 ohms, nominal	
All Inputs	10 kohms, nominal	

Characteristic	Specifications	Supplemental Information
AC characteristics		
Clock frequencies, input or output		
Master clock	49.152 MHz maximum	
Bit clock	49.152 MHz maximum	
Frame	192 kHz maximum	
Output latency		
Frame		*typ 3 nsec referenced to Bit clock*
Data 1–4		*typ 3 nsec referenced to Bit clock*
Monitor ports		*typ 10 nsec referenced to Signal pin*
Input setup and hold requirements		
Frame, setup		*6 nsec referenced to Bit clock*
Frame, hold		*2 nsec referenced to Bit clock*
Data 1–4, setup		*6 nsec referenced to Bit clock*
Data 1–4, hold		*2 nsec referenced to Bit clock*

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